

XXVI. A REVISION OF THE ORIENTAL
SUBFAMILIES OF TARANTULIDAE
(ORDER PEDIPALPI).

By F. H. GRAVELY, *M.Sc., Asst. Superintendent, Indian
Museum.*

(Plate XXXI.)

The species of Tarantulidae are rendered exceptionally difficult to separate and define by the insignificance of many of their most distinctive characters, and by the conspicuousness of others whose striking modifications indicate the age of a specimen rather than the species to which it belongs. It is only by the study of long series of specimens that the latter characters can be eliminated and the former recognized with certainty. Kraepelin's "*Revision der Tarantuliden*" (Abh. Ver. Hamburg, xiii [3] 1895, 53 pp., 1 pl.) has straightened out the synonymy of the family, and has gone a long way towards putting the classification into shape. But when this, and the volume of "*Das Tierreich*" by which it was followed, were written, the material available for study appears to have been somewhat scanty. A number of described species which are undoubtedly distinct had therefore provisionally to be united; and a number of species still remain unnamed.

I have now for several years been making special efforts to obtain adequate series of specimens from different parts of the Indian Empire, and whenever possible from beyond. In the present paper I propose to consider the Oriental species in the light of material recently obtained; and it seems best to complete the paper by references to all known members of the two subfamilies dealt with, although those found outside the Oriental Region are not well represented in the material before me.

I am indebted for help in getting material to Dr. Henderson, Mr. E. E. Green, Mr. Kinnear, Mr. T. Bainbrigge Fletcher and especially to Mr. B. H. Buxton who has presented to the Indian Museum a number of new species which he recently collected in the Malay Peninsula.

With the exception of *Stygophrynus moultoni*, of which the type is in the British Museum, the types of all new species described below are in the Indian Museum.

SUBFAMILIES AND GENERAL STRUCTURE.

The Oriental Tarantulidae fall into two very distinct subfamilies, which may be recognized thus:—

- Pulvilli present; hand able to bend till it forms a right angle with the tibia, the terminal spines of which are directed sideways; prosomatic sterna small, more or less tuberculiform *Charontinae*, p. 435.
- Pulvilli absent; hand unable to bend at less than an obtuse angle to tibia, the terminal spines of which are directed forwards in adults above base of hand; prosomatic sterna broadly expanded, lightly concave or flat *Phrynichinae*, p. 447.

The American subfamily Tarantulinae differs from the subfamily Charontinae chiefly in the absence of a pulvillus.

The structure of the arm and hand, though differing in detail in different species, is remarkably uniform in plan in the young of all the species of Tarantulidae whose development is known to me. Considerable changes, however, take place during the growth of individuals belonging to the larger species. This is especially the case with species of the subfamily Phrynichinae, the hand of which is so modified in the adult that each is capable of grasping prey without the aid of the other (see Gravelly, 1915, pl. xxiv, fig. 28 of this volume). In this respect the Phrynichinae may be regarded as more highly specialized than the Charontinae, and as the structure of the arm and hand presents greater difficulties than does that of other organs, the Charontinae may conveniently be considered before the Phrynichinae.

In some respects, however, the former are probably more highly specialized than the latter. The jointing of the hind tibiae, for instance, which is often less marked, when it occurs, in young specimens than in old ones, is carried further in the Charontinae than in the Phrynichinae. And it is difficult to think that pulvilli can ever have been present in creatures with the habits of the Phrynichinae, when these are not found in them at the present day. For both Phrynichinae and Charontinae habitually live clinging to the underside of stones or logs of wood; and the latter, which have pulvilli, can cling in this position to polished glass, whereas not even the young of the former, which lack them, can do this.

The fundamental structure of the arms and hands of the Tarantulidae may now be described as it is to be seen, more or less distinctly, in the young probably of all species, and in the adults of many Charontinae. The modifications to which it is subject during the growth of the more highly specialized forms are all in the direction of the specialization of particular spines and the loss of others.

The anterior face of the trochanter is bounded above by a dorsal row of spines, and below by a ventral cluster; while between these is a middle group or longitudinal row.

The anterior face of the femur is flattened, and is bounded by a dorsal and a ventral row of spines. The tibia is similarly flattened in front and armed above and below, the spines of the distal half of the dorsal row always being much the longest.

The hand is armed with two spines above and one below. Occasionally additional spines are also present.

The finger may be armed at the base with 0, 1 or 2 dorsal spines, which remain throughout life. It is always unarmed ventrally.

Subfamily CHARONTINAE.

The structure of the second visible abdominal sternum and of the margin of the carapace opposite the lateral eyes, the relative lengths of the two dorsal spines on the hand and of those on the end of the arm, and the jointing of the finger and of the tibia of the fourth leg, appear to be the principal characters that have been used in the definition of genera.

The structure of the posterior margin of the second visible abdominal sternum seems to be very variable, and I am unable to attach any importance to it.

The segmentation of the hind tibiae is often less marked in the young of species in which it occurs, than in adults; it is sometimes variable within the limits of a single well-marked species, and it reaches its highest development in more than one genus, among them the specialized cavernicolous genus *Stygo-phrynus*. There can, I think, be little doubt that the extent of this segmentation is a mark of the degree of specialization in the species in which it occurs. Probably increased segmentation facilitates in some way the activities of the animal exhibiting it, and may appear independently in different branches of the subfamily. It is also found in the genus *Damon* of the subfamily Phrynichinae.

In species in which the hind tibiae are normally not more than 3-jointed, the tarsi (excluding the metatarsi) appear to be invariably 4-jointed. In most species in which the hind tibiae are 4-jointed the tarsi are 5-jointed. *Sarax javensis* is the only species known to me which appears to have both tibiae and tarsi of the hind legs 4-jointed, and as I have only one specimen before me the tibiae may be abnormal. The structure of the tarsi appears to be constant within the limits of each species, whereas in *Phrynichosarax cochinchinensis* and *singapurae*, and perhaps therefore in other species also, the structure of the tibiae is variable. Although, therefore, the structure of the hind tibiae is usually much easier to distinguish than is that of the tarsi, it seems best to use the latter rather than the former for the separation of genera.

The structure of the margin of the carapace appears to be of more fundamental importance from a taxonomic point of view than is the structure of the legs. By its means the subfamily may split into two distinct groups. One of these, which may be termed the *Sarax* group, includes only small species whose distribution extends from India through Malaysia as far as the Solomon Islands.

The other, which may be termed the *Charon* group, includes the small species found on the outskirts of and beyond this area from the Seychelles to the Galapagos Islands, together with the large and highly specialized species belonging to the genera *Stygo-phrynus* and *Charon*.

The *Charon* group is probably older than the *Sarax* group, its range being wider, the hind tibiae being 4-jointed in all except two species (in which they are 3-jointed), and the arms being comparatively long and slender, at least in well developed males, in most if not all species. The carapace of the former group, too, resembles that of all other subfamilies of Tarantulidae, and also, apparently, that of the newly hatched larvae of the only species—*Phrynichosarax cochiniensis*—of the *Sarax* group whose larvae I have seen.

The hind tibiae of the *Sarax* group may be 2-jointed (occasionally even entire), and the proportion of the species in which they are 4-jointed appears to be smaller than in the *Charon* group. The arms are almost invariably short and stout even in males.

The relative lengths of the two dorsal spines on the hand, and of those on the end of the arm, may perhaps to some extent be correlated with cavernicolous habits in both groups. So far as I know, however, nothing is known of the habits of the genus *Charon*, one of the two genera of its group in which the spines tend to resemble those of the single exclusively cavernicolous genus *Catagens* of the *Sarax* group. A few species of the latter group belonging to the non-cavernicolous genera have, moreover, been found in caves.

The finger is jointed in all genera except *Charon*.

The genera of Charontinae may now be defined as follows:—

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|----|---|--|
| 1. | { | Margin of carapace indented beside lateral eyes (<i>Sarax</i> group) 2. |
| | | Lateral eyes situated further from margin of carapace, which is entire ... (<i>Charon</i> group) 4. |
| 2. | { | Longest spine on tibia of the arm the middle one of five well developed dorsal spines in adults, and of three in young; proximal dorsal spine of hand longer than distal <i>Catagens</i> , p. 437. |
| | | Penultimate well developed dorsal spine of tibia of arm the longest in all stages; distal dorsal spine of hand longer than proximal ... 3. |
| 3. | { | Tarsi (exclusive of metatarsi) 4-jointed; hind tibiae 2- to 4-jointed (sometimes entire on one side) but normally 3-jointed (? always) ... <i>Phrynichosarax</i> , p. 437. |
| | | Tarsi (exclusive of metatarsi) 5-jointed; hind tibiae 4-jointed <i>Sarax</i> , p. 441. |
| 4. | { | Penultimate dorsal spine of tibia of arm the longest, the one next behind it longer than the one next behind that; distal dorsal spine of hand longer than proximal, not accompanied by additional spines 5. |
| | | Penultimate dorsal spine of tibia of arm not longer than the one next behind it, often about equal to the one next behind that, sometimes even shorter; long spine on dorsal side of hand usually succeeded by several shorter ones, ¹ a short spine often fused to it proximally at base 6. |

¹ Always, so far as is known, except in *Stygophrynus moultoni*, for which a new genus ought perhaps to be established.

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|----|---|---|-----|-----|-------------------------------|
| 5. | { | Tarsi (exclusive of metatarsi) 4-jointed; hind tibiae 3-jointed | ... | ... | <i>Charinides</i> , p. 442. |
| | | Tarsi (exclusive of metatarsi) 5-jointed; hind tibiae 4-jointed | ... | ... | <i>Charinus</i> , p. 442. |
| 6. | { | Finger jointed, three dorsal spines of tibia of arm much longer than any others | ... | ... | <i>Stygophrynus</i> , p. 443. |
| | | Finger unjointed; two dorsal spines of tibia of arm much longer than any others | ... | ... | <i>Charon</i> , p. 446. |

Genus *CATAGEUS*, Thorell.¹

Type *Catageus pusillus*, Thorell. No other species of the genus is known, *C. rimosus*, Simon, belonging in reality to the following genus.

Catageus pusillus, Thorell.²

(Plate xxxi, fig. 1.)

Catageus pusillus is only known from the Khayon ("Farm") and Dhammathat caves near Moulmein.

The Indian Museum collection includes specimens from both groups of caves. They were found under stones, and their habits have already been described.³

The *carapace* of our largest specimen is 4.4 mm. across and 3.2 mm. long in the middle line. The *arms* (see fig.) are short and stout in all specimens. The finger is armed dorsally with two minute and slender spinules (see fig.). The *antenniform legs* are very variable in length, their femora being from about two to about three times as long as the carapace is broad. The femora of the first pair of *walking legs* are about 1.3-1.5 times as long as the carapace is broad. The metatarsi of the same pair of legs are about 1.2 or 1.3 times as long as the tarsi, and the first tarsal joints are about 1.4 or 1.5 times as long as the remaining tarsal joints.

Genus *PHRYNICHOSARAX*, n. gen.

Margin of carapace indented beside lateral eyes; penultimate dorsal spine of tibia of arm longer than all others; distal dorsal spine of hand longer than proximal; hind tibiae normally composed of less than four pieces, tarsi of less than five.

Type *Phrynichosarax cochiniensis*, n. sp.

Five species are known to me. They may be distinguished thus:—

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|----|---|--|----------------------------------|
| 1. | { | Dorsal margin of finger armed with one spine | 2. |
| | | Dorsal margin of finger armed with two spines | 3. |
| 2. | { | Spine of finger long; hind tibiae 2- to 3-jointed | <i>P. cochiniensis</i> , p. 438. |
| | | Spine of finger minute; hind tibiae (? always) 4-jointed | <i>P. javensis</i> , p. 439. |
| 3. | { | Spines on finger large and conspicuous, the distal one about twice as long as the proximal | <i>P. buxtoni</i> , p. 439. |
| | | Spines on finger small and of more nearly equal size | 4. |
| 4. | { | Spines on finger small but quite distinct | <i>P. singapurae</i> , p. 440. |
| | | Spines on finger minute and inconspicuous | <i>P. rimosus</i> , p. 440. |

¹ *Ann. Mus. Civ. Genova*, XXVII, p. 530.

² *Ibid.*, pp. 531-8.

³ *Journ. Asiat. Soc. Bengal* (n. s.), IX, 1914, p. 419.

Phrynichosarax cochinensis, n. sp.

(Plate xxxi, fig. 2.)

This species is common under stones in the evergreen jungles of the lower slopes of the Western Ghats in Cochin, and it is on account of the large number of specimens available for study that I have selected it as the type of the genus. The specimens were found near Kavalai, on the Cochin State Forest Tramway, at altitudes up to about 2500 ft. above sea level; at about 0-300 ft. above sea-level near the same tramway between miles 10 and 14; and at the base of the hills near Trichur. Specimens from the last-named locality differ from the others in that the legs (both kinds) tend to be much longer and slenderer, while the separation of the first and second joints of the hind tibiae is usually obscure or absent. In one specimen, indeed, the right hind tibia is entire.

As type of the species I have selected a female with young still adhering to her back in the preserved state. This specimen is from jungle beside the lower part of the State Forest Tramway.

The *carapace* is $1\frac{1}{2}$ times as wide as it is long in the middle line, or may be a little wider; its maximum width is slightly over 4 mm. It resembles that of *P. buxtoni* (below, p. 439) in general structure, but is finely and evenly granular throughout, and usually *looks* much broader in proportion to its length. The depression in the median groove behind the eyes is less defined, although the groove is well developed. The second radial grooves of the two sides are united across the middle-line, together forming an almost straight line in contact with the anterior part of the fovea.

The *arms* are always short and stout. The proximal dorsal spine on the hand is scarcely as long in proportion to the distal as in *P. buxtoni*. There is only one spine on the finger (see pl. xxxi, fig 2); it is situated close to the base of the dorsal margin, and is about as long as the ventral spine of the hand, which latter spine is situated close to the lower distal angle.

The *legs* are variable in length. The femora of the antenniform legs may be from scarcely $1\frac{1}{2}$ to fully $2\frac{1}{2}$ times as long as the carapace is wide. The femora of the first pair of walking legs may be from a little less than, to nearly $1\frac{1}{2}$ times as long as the carapace is wide. The metatarsi are longer than the tarsi, and the first tarsal joint of each leg is longer than are the rest together—very slightly so in short-legged specimens and much more so in long-legged. The hind tibiae may be more or less distinctly 2- or 3-jointed. In one specimen that of the right side is entire, that of the left side being 2-jointed. The extent of the jointing of the hind tibiae and the slenderness of the legs appears to be correlated with locality as noted above. All the localities from which the species is yet known are situated in one comparatively small area, over the whole of which comparatively uniform conditions

probably prevail. Specimens from any one of these localities appear to exhibit a much smaller range of variation than the species as a whole, their extremes scarcely, indeed, overlapping. The fact that this much variation does, however, occur, and that specimens from other localities in the same neighbourhood may ultimately be proved to show similar ranges of variation which overlap extensively, seems to render it improbable that the Trichur form ought to be recognized as a definite race worthy of a subspecific name.

***Phrynichosarax javensis*, n. sp.**

(Plate xxxi, fig. 3.)

Only one specimen is known to me. It is from Buitenzorg. It differs from *P. cochinensis* only in the minuteness of the spine on the finger (see pl. xxxi, fig. 3) and in the 4-jointed hind tibiae. The 4-jointed tarsi suggest that a larger series would be not unlikely to show that the hind tibiae were normally 3-jointed as in other members of the genus.

The carapace is 3.2 mm. broad by 2.2 mm. long in the middle line. The femora of the antenniform legs are 4.8 mm. long, those of the first walking legs 2.9 mm.

***Phrynichosarax buxtoni*, n. sp.**

(Plate xxxi, fig. 4.)

Two specimens (one immature) were collected by Mr. B. H. Buxton in Kubang Tiga cave, Perlis, Malay Peninsula.

The *carapace* is heart-shaped. In the mature specimen (♀) it is 4.1 mm. broad by 3.3 mm. long in the middle line. Behind the lateral eyes it is bordered by a broad horizontal ledge. The fovea is deeply impressed, continuous with a pair of large lateral grooves directed slightly backwards, and with a short median groove behind it. In an anterior median groove, about two-thirds of the way from the fovea to the eye, is a hollow somewhat smaller than the fovea, with which, and with two pairs of lateral depressions together enclosing a rectangle, it forms an almost regular hexagon. The anterior sides of this hexagon are, however, a little longer than the posterior, and these than the lateral. A radial groove extends outwards and a little forwards from each member of the two pairs of lateral depressions, and between the posterior of these grooves and the lateral grooves connected with the fovea is a pair of short grooves extending from the margin about half way to the fovea. A single line of tubercles runs from the fovea outwards and backwards towards the margin between the last-mentioned grooves and those immediately behind them. The rest of the surface is ornamented with less definite bands and patches of tubercles.

The *arms* are short and stout. The proximal dorsal spine of the hand is little more than half as long as the distal; there is a somewhat shorter spine on the ventral margin. Even the ventral of the spines of the hand is, however, longer than either of the two

spines with which the finger is armed. Both the spines on the finger are dorsal, and the proximal is less than half the size of the distal, being about equal in length to the distance from its base to the base of the finger or of the distal spine (pl. xxxi, fig. 4).

The femora of the antenniform legs are 8.6 mm. long in the adult specimen, those of the first walking legs being 5.5 mm. The anterior metatarsi are 2.6 mm. long, the anterior tarsi 2.0 mm. The tarsi are 4-jointed, the first joint distinctly longer in all legs than the other three together. The posterior tibiae are 3-jointed in both specimens.

Phrynichosarax singapurae (Gravely).¹

(Plate xxxi, fig. 5.)

In view of what has been pointed out above with reference to *P. cochinensis*, it is very doubtful whether the proportions of the legs have any great taxonomic importance; and it was on these that my preliminary separation of the present form as a subspecies of *Sarax sarawakensis* was based. A more detailed examination has shown, however, that the armature of the hand and finger of the Singapore form differs markedly from that of the Sarawak form, and that the tarsi have one joint less.

Only one out of our series of eleven specimens from Singapore shows any trace of a fourth joint in the hind tibiae, though this joint is well developed in two specimens recently collected by Mr. B. H. Buxton in Lankawi (? main island) off the west coast of the Malay Peninsula. One of the Lankawi specimens has slenderer arms than any other specimen belonging to the *Sarax* group known to me.

This species is closely related to the next, from which it only differs in the larger size of the spines on the hand (compare figs. 5 and 6, pl. xxxi).

Phrynichosarax rimosus (Simon).²

(Plate xxxi, fig. 6.)

The Superintendent of the Cambridge University Zoological Museum has been good enough to send me the type specimen of this species for examination. It is an ovigerous female, and was found by a member of the "Skeat" expedition to the Malay Peninsula at Kuala Aring in Kelantan. The species is represented in our collection by two specimens (one probably, the other certainly, immature) collected by Mr. B. H. Buxton in Lankawi (? small island not far from main island) off the west coast of the Malay Peninsula.

The *carapace* resembles that of *P. buxtoni* rather than that of *P. cochinensis*, but the depression in the anterior part of the

¹ *Sarax sarawakensis* subsp. *singapurae*, Gravely, *Rec. Ind. Mus.*, VI, pp. 36-38.

² *Proc. Zool. Soc. London*, 1901, p. 77.

median groove is not distinct. The hand also resembles that of *P. buxtoni*. The finger is armed above with two spines situated as in *P. buxtoni*, but quite minute, each being about half as long as the shorter of the two found in that species (see pl. xxxi, fig. 6). In this character *P. rimosus* resembles species of the following genus.

Genus **SARAX**, Simon.¹

Type *S. brachydactylus*, Simon.

In "*Das Tierreich*" Kraepelin recognized two species in this genus, *S. brachydactylus*, Simon, and *S. sarawakensis* (Thorell). A number of species have undoubtedly, however, been grouped together by various authors under the latter name, including some belonging to the genus *Phrynichosarax*.

S. brachydactylus is not known to me. The remaining species may be distinguished thus:—

Proximal spine of hand slightly more than half			
as long as distal <i>S. willeyi</i> , p. 441.
Proximal spine of hand scarcely half as long as			
distal <i>S. sarawakensis</i> , p. 441

Sarax brachydactylus, Simon.²

Simon records this species from Luzon in the Philippines, where it was found in the caves of Antipolo (Province Morong), San-Mateo (Province Manila) and Colapnitam (Province Camarines-Sur).

Sarax willeyi, n. sp.²

(Plate xxxi, fig. 7.)

Two specimens preserved in the Indian Museum were collected by Dr. Willey in New Britain. The only character by which they appear to be distinguished from *S. sarawakensis* has been noted in the above key (see also pl. xxxi, figs. 7 and 8). In both *S. willeyi* and *S. sarawakensis* the spines on the finger are extremely small. In this respect these species closely resemble *Phrynichosarax rimosus*, which *S. willeyi* also resembles in all other characters except the structure of the legs by which the genera *Sarax* and *Phrynichosarax* are separated.

A specimen from Narcondam Island in our collection, and one from Table Island (Andamans) in the British Museum collection, must belong to this species or to one not yet described; but the spines on the finger are imperfect in both.

Sarax sarawakensis (Thorell).³

(Plate xxxi, fig. 8.)

This species was described by Thorell from Sarawak. Mr. Moulton has sent me from the Sarawak Museum two specimens

¹ *Ann. Soc. Ent. France*, LXI, 1892, p. 43.

² *Ibid.*, pp. 43-44.

³ *Charon sarawakensis*, Thorell, *Ann. Mus. Civ. Genova*, XXVI, 1888, pp. 354-358.

found on Klingkang summit, between Sarawak and Dutch Borneo. They differ from all other species of *Sarax* and *Phrynichosarax* known to me in the markedly greater difference in size between the two spines on the dorsal margin of the hand (see pl. xxxi, fig. 8). The spines on the finger are minute as in the preceding species.

The larger specimen is somewhat larger than the type, the carapace being 4.5 mm. in width.

Genus CHARINIDES, Gravely.¹

Type *Charinides bengalensis*, Gravely.

The genus *Charinides* bears to *Charinus* the same relation as does the genus *Phrynichosarax* to *Sarax*. Both *Charinides* and *Charinus* resemble the preceding genera in general structure, and in the size to which specimens grow. They differ only in the structure of the ocular part of the carapace and in this they resemble the following genera, from the much larger adults especially of which they differ markedly in the structure of the arm and hand.

Only one species of *Charinides* is known.

Charinides bengalensis, Gravely.¹

This species is only known from Calcutta and its immediate neighbourhood, where it is quite common under bricks in shady places where desiccation is not too severe.

The proximal spine on the dorsal margin both of the *hand* and of the *finger* is about half as long as the distal. These spines are long and slender on the finger as well as on the hand (see pl. xxiv, fig. 29 of this volume). They closely resemble those of *Phrynichosarax buxtoni* (pl. xxxi, fig. 4).

Genus CHARINUS, Simon.²

Type *C. australianus* (Koch).

The genus *Charinus* is represented in the Indian Museum collection by two specimens of *C. seychellarum*, Kraepelin.

Kraepelin distinguishes three species in "*Das Tierreich*" :—*C. australianus* (Koch)³ from Viti and Samoa, *C. neocaledonicus*, Simon,⁴ from New Caledonia, and *C. seychellarum*, Kraepelin,⁵ from the Seychelles. *C. insularis*, Banks,⁶ has since been described from the Galapagos Islands.

This genus and the preceding include all the most primitive species of the group to which they belong, and it is noteworthy that they are only found north, east and west of the country inhabited by the following genera, genera of which the adults are much larger and have more highly specialized arms and hands.

¹ *Rec. Ind. Mus.*, VI, pp. 35-36, fig. 2B.

² *Ann. Soc. Ent. France*, LXI, 1892, pp. 43 and 48.

³ *Phrynus australianus*, Koch., *Ver. Ges. Wien*, XVII, p. 231.

⁴ *Abh. Ver. Hamburg*, XIII, p. 47.

⁵ *Mitt. Mus. Hamburg*, XV, p. 41.

⁶ *Proc. Washington Ac.*, IV, p. 67, pl. ii, fig. 8.

Genus **STYGOPHRYNUS**, Kraepelin.¹

Type *S. cavernicola* (Thorell).

In this genus, as in all of the foregoing of which I have sufficient knowledge to speak with certainty, particular spines on the second appendages have proved to provide admirable characters for specific diagnoses, while others are absolutely worthless for this purpose. The granulation of the surface of these appendages, and of the carapace, is also important in this connection.

The following species may be recognized:—

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|------------------|---|---|---------------------------------|
| 1. | { | Armature of hand consisting of two long dorsal spines and one ventral one only | <i>S. moultoni</i> , p. 443. |
| | | Hand armed above and below with one long spine succeeded by a series of short spines which increase in length distally | |
| 2 ² . | { | Adults pale in colour ² , rather small and very lightly built, with long slender arms; ocular lobes of carapace finely and evenly granular, without tubercles | <i>S. cavernicola</i> , p. 444. |
| | | Adults somewhat or much darker in colour, larger and more heavily built with much stouter arms, ocular lobes of carapace more coarsely and less evenly granular, usually marked with a number of scattered tubercles | |
| 3. | { | Distal of three long spines on dorsal margin of tibia of arm with a spine of nearly half its own length on either side of it | <i>S. longispina</i> , p. 445. |
| | | Spines on either side of distal of three long spines on dorsal margin of tibia of arm quite short in adults, the proximal one short in young specimens also | |
| 4. | { | Adults somewhat pale ² in colour, not very strongly granular | <i>S. berkeleyi</i> , p. 445. |
| | | Adults very dark and strongly granular | |

***Stygophrynus moultoni*, n. sp.**

(Plate xxxi, fig. 9.)

Mr. Moulton has sent me a single much broken specimen of this species. It was found on Klingkang summit, between Sarawak and Dutch Borneo. It is somewhat small, but appears to be mature or very nearly so. It is a male and is very distinct from all other species of the genus.

The *carapace* is 7.4 mm. broad by 5.7 mm. long in the middle line. It is somewhat pale in colour, finely granular and without tubercles, like that of *S. cavernicola*.

The *arms* (pl. xxxi, fig. 9) are somewhat slender, but are much shorter than in adult males of that species, the femur being no longer than the carapace is broad. The armature of the femur resembles that of *S. cavernicola*, but the spines are necessarily closer together. The tibia is also armed much as in that species, but the subsidiary spines among the longer spines of the ventral

¹ *Abh. Ver. Hamburg*, XIII, p. 44.

² The young of all species are pale in colour and have relatively short arms.

margin are obsolete, while on the dorsal margin the first of the three long spines is situated in about the middle of the length of the joint, as in females of *S. cavernicola*. This spine is preceded by an additional spine about half way to the base of the joint and nearly as long as the spine following the distal of the three long spines, which terminal spine is fully half as long as the three long spines. The granulation of the convex posterior surface of both femur and tibia is obsolete. The backs of the hand and finger are smooth. The hand is armed above by two spines of about equal length and not much shorter than the long spines of the upper margin of the tibia; it is armed below by one somewhat shorter spine opposite the distal of the two upper ones. The finger is armed above with three minute tooth-like spinules.

The *legs* are coloured in a similar manner to the rest of the body. They appear to have been long and slender, with the antenniform legs exceptionally long as in the other species of the genus, all of which are known to be cavernicolous. The hind femur scarcely exceeds the basal piece of the hind tibia in length by more than the length of the patella, which suggests that the remaining pieces, which are broken, may have been two instead of three in number.

Stygophrynus cavernicola (Thorell).¹

The habits of this species have been described from specimens found, like the type specimen, in the Khayon or "Farm" caves near Moulmein.² The Indian Museum collection includes a number of specimens from the larger of these caves, and two from a small cave at Dhammathat. The species has been recorded from Saigon by Kraepelin.³ Kraepelin had, however, insufficient material for the determination of specific characters⁴, and geographical considerations render it very improbable that this determination is correct.

The *carapace* of specimens which are probably adult—no ovigerous females of this species ever appear to have been found—is about 9.5 mm. broad by 7 mm. long in the middle line. It is of a pale yellowish-brown colour, and is finely granular as in the preceding species.

The *arms* are always slender; in the female the femur is a little longer than the carapace is wide, in the male it is nearly twice as long. The femur and tibia are finely granular, with two smooth longitudinal bands on the convex posterior surface. There

¹ *Charon cavernicola*, Thorell, *Ann. Mus. Civ. Genova*, XXVII, 1889, pp. 538-542.

² *Journ. Asiat. Soc. Bengal* [n.s.], IX, 1914, pp. 418-9.

³ *Bull. Mus. Hist. Nat. Paris*, 1901, p. 265.

⁴ This statement is based on an examination of specimens from Mentawai and Java, which Prof. Kraepelin showed me in Hamburg. They, too, are distinct and Prof. Kraepelin very kindly promised to send them to me for description whenever I should be ready to deal with them, a promise whose fulfilment the war has unfortunately made impossible.

is sometimes a small spine between the three long distal spines on the dorsal margin of the tibia and the base of the joint, especially in the female. The three long spines are succeeded by a spine of about half their own length, but the spines between them are never well developed and are often absent. The hand is armed above and below with one very long spine, succeeded by a series of much shorter ones, of which the distal are longer than the proximal, the dorsal spines being somewhat longer than the ventral. The long dorsal spine bears at its base a strong backwardly directed spinule, and this is often succeeded in adults by a short row of very much smaller spinules on the margin of the long spine. The finger is unarmed.

The *legs* are pale in colour like the rest of the body.

***Stygophrynus longispina*, n. sp.**

(Plate xxxi, fig. 10.)

Two male and two immature specimens were collected by Mr. Buxton in a cave on Langkawi Island off the west coast of the Malay Peninsula.

The *carapace* of the adults is about 12 mm. broad by 9 mm. long in the middle line. It is of a very dark brown colour, and is somewhat more coarsely and sparsely granular than is that of the preceding species, with a few strong tubercles among the granules.

The *arms* are very short and stout, their femora being little if at all longer than the carapace is wide. Their femora and tibiae are more coarsely granular than in *S. cavernicola* and the smooth bands on the convex posterior surface are invaded by scattered rows of granules. The three long spines on the dorsal margin of the tibia are followed, as in *S. cavernicola*, by a spine of about half their own length (perhaps a little shorter in the present species), and a similar but even longer spine occurs between the last two of them, serving to distinguish this from all other species known to me. The hand (pl. xxxi, fig. 10) is armed as in *S. cavernicola*, but is somewhat more coarsely and less extensively granular behind. The finger is unarmed as in that species.

The *legs*, especially the antenniform legs, are long and slender as in other species of the genus. They are dark in tint, harmonizing with the rest of the body though actually somewhat paler than the carapace and much darker than the abdomen.

***Stygophrynus berkeleyi*, n. sp.**

(Plate xxxi, fig. 11.)

One male and several immature specimens were collected by Mr. Buxton in caves at Lenggong, Perak, Malay Peninsula. The species is named after Mr. H. Berkeley, the District Officer of Upper Perak, who greatly facilitated Mr. Buxton's work in the district.

The *carapace* of the adult male is 15 mm. broad by 10.5 mm. long in the middle line. It is paler in colour than is that of

S. longispina, but lacks the yellow tint of that of *S. cavernicola*. The immature specimens with it suggest that this is the normal colouration of the species. The granulation of the carapace is very coarse, and the tubercles are more numerous and more conspicuous than in *S. longispina*.

The *arms* are longer than in *S. longispina*, the femora being about 20 mm. in length (four-thirds as long as the carapace is broad), but are very stout. The granulation of the femora, tibiae and hands resembles that found in *S. longispina* (compare figs. 10 and 11, pl. xxxi). The only well-developed spines on the upper margin of the tibia are the three long ones near the distal end which are characteristic of the genus; all others are quite small, the contrast being more marked in the adult than in the immature specimens. The hand and finger resemble those of *S. longispina*.

The *legs* resemble those of other members of the genus, but the walking legs especially are of a much paler and more yellowish colour than in *S. longispina*, this colour difference between the two species being somewhat more marked in the legs than in the carapace.

Stygophrynus cerberus, Simon.¹

(Plate xxxi, fig. 12.)

The habits of this species from the Jalor caves (Gua Glap or "Dark Cave", and Biserat) have been described elsewhere.² Cotypes have been presented to the Indian Museum by the Cambridge Museum.

This species closely resembles *S. berkeleyi*, but has all the integuments harder, much darker in colour, and more strongly granular (compare pl. xxxi, figs. 11 and 12).

Stygophrynus spp. indet.

In addition to the species from Saigon, Mentawai and Java already referred to (p. 444), mention may be made of "an animal allied to Phipson's *Tarantula*" found by Flower in the depths of the Batu Caves at Selangor,³ which may well have belonged to this genus.

Genus CHARON, Karsch.

This genus is represented in the Indian Museum collection by one immature specimen of *C. grayi*, the only species recognized by Kraepelin in "*Das Tierreich*." *C. annulipes*, Lauterer,⁴ does not appear to be referred to in that work, but it cannot be recognized either from the description or from the figure. It is compared with *C. australianus*, Koch, a species now placed in the genus *Charinius*. Its position must remain uncertain till the type is re-examined.

¹ *Proc. Zool. Soc. London*, 1901, pp. 76-7.

² *Fourn. Asiat. Soc. Bengal* (n.s.), IX, 1911, p. 419.

³ *Rep. Austr. Ass.* VI, 1895, pp. 413-4, pl. lii.

⁴ *J. Straits R. Asiat. Soc.*, No. 36, 1901, p. 40.

Subfamily *PHRYNICHINAE*.

Kraepelin divides this subfamily into genera as follows :—

1. { Tibia of fourth leg 1-jointed; hand of adult with
basal of two dorsal spines rudimentary or absent.¹ *Phrynichus*, p. 447.
2. { Tibia of fourth leg 2-jointed; both dorsal spines
of hand strongly developed in adult ... *Damon*, p. 455.

Genus *PHRYNICHUS*, Karsch.²

Type *P. reniformis* (Linn.).

The generic identity of Linnaeus's *Phalangium reniforme*, which has an important bearing on the nomenclature of the subfamily, has been much in dispute. Kraepelin summarised the available evidence at the commencement of his "Revision der Tarantuliden"³, and has given his final opinion as regards the correct nomenclature in "*Das Tierreich*."⁴ His conclusions have been confirmed by Lönnberg, who examined the type still preserved in the Zoological Museum at Upsala.⁵

The generic identity of *Phalangium reniforme* having been settled, its specific identity was for Kraepelin a simple matter, since, from the material at his disposal, he was unable to recognize more than two species in the genus. The rich material in the Indian Museum collection shows, however, that several of the names regarded by Kraepelin as synonymous with *Phrynichus reniformis* will have to be revived; and that even these will not cover all the species to which the name *P. reniformis* may conceivably belong. The description of *P. reniformis* is generic rather than specific, and the identity of the species must, I am afraid, remain a matter of doubt until the type is redescribed. Lönnberg says, "To judge from the descriptions and from the table given by Pocock, the Linnean specimen most closely agrees with '*Ph. deflersi*,' Simon." But the value of the characters used by Pocock in diagnosing this species is perhaps open to question; and it is more likely that the Linnean specimen belongs to one of the two well-known forms called below *P. ceylonicus* and *P. nigrimannus* respectively, than to a species only known otherwise from a single specimen from Obock.

The description of *P. lunatus* (Pallas) is also generic rather than specific; and the figures with which it is accompanied are too rough to be of any help. The identity of this species also must therefore remain in doubt.

P. ceylonicus (Koch) is clearly a large species found in Ceylon. Only one such species is known to me, and I have accordingly applied the name to it.

P. scaber (Gervais) comes from the Seychelles (? and Mauritius). It is probably distinct from the Indian and Ceylonese species, but

¹ Except in *P. deflersi* (Simon).

² *Arch. Naturg.* XLV (1), 1879, p. 190.

³ *Abh. Ver. Hamburg* XIII, 1895, pp. 1-53, 1 pl.

⁴ See also *Zool. Anz.* XXVIII, 1904, pp. 201-203.

⁵ *Ann. Mag. Nat. Hist.* (7) I, 1898, pp. 88-89.

the description is again generic, not specific, and as I have no specimens before me from these islands I cannot add to it.

P. nigrimanus (Koch) is from India. It is probably the species common in the Eastern Ghats, as has already been suggested by Hansen.¹ This is the only species known to me of which (spirit) specimens ever seem to resemble Koch's figure in colour.

P. deflersi (Simon) may be distinguished by the presence, even in large specimens such as the type of the species, of two well developed spines on the dorsal margin of the hand, as in the genus *Damon*. Both these spines are, however, present in the young of certain other species.

P. jayakari, Pocock, differs from all other known species in the presence of a pair of stout spines on the margin of the carapace in front of the lateral eyes.

P. phipsoni, Pocock, is a distinct species, apparently confined to the northern parts of the Western Ghats.

P. pusillus, Pocock, is a common Ceylonese form, allied to but distinct from *P. ceylonicus* (Koch) of which it may conveniently be regarded as a variety. It is much smaller than this or any other species of the genus known to me.

Phrynichus scullyi, Purcell, from S. Africa² is probably described from immature specimens, but as I have not seen any I cannot speak with certainty.

P. bacillifer (Gerst.) remains, of course, distinct.

The determinable species of the genus may be recognized thus:—

1.	{	Margin of carapace without strong spines ...	2.
		Margin of carapace with a pair of strong forwardly directed tooth-like spines in front of lateral eyes	<i>P. jayakeri</i> , p. 455.
2.	{	One spine only present on upper margin of hand of adult	3.
		Vertical basal spine as well as oblique spine distal to it persistent on upper margin of hand in adult	<i>P. deflersi</i> , p. 455.
3.	{	Anterior surface of femur of arm with 3-5 sharp spines, or simply granular; lower margin always with some sharp spines	4.
		Anterior surface of femur of arm with 2 or 3 blunt rounded bacilliform processes in the basal third; lower margin spineless	<i>P. bacillifer</i> , p. 455.
4.	{	A longitudinal row of granules present on lower surface of hand (pl. xxxi, fig. 14)	<i>P. ceylonicus</i> , p. 449.
		Lower surface of hand smooth (pl. xxxi, fig. 13). Tibia of arm of adult with two long terminal dorsal spines preceded only by a minute tubercle ³ ; basal dorsal spine of hand absent in adult, small or absent in young	5.
5.	{	Tibia of arm of adult with the two long terminal dorsal spines preceded by a minute tubercle ³ ; basal dorsal spine of hand absent in adult, small or absent in young	<i>P. nigrimanus</i> , p. 453.
		Tibia of arm of adult with the two long terminal dorsal spines preceded by a short but well developed spine; basal dorsal spine of hand probably always well developed in young, represented by a tubercle in adult	6.

¹ *Ent. Med.* IV, 1894, p. 150.

² *Ann. S. Afr. Mus.* II, 1900-1902, p. 206.

³ This tubercle replaces a spine which is present in the young of this as of other species.

6. { Terminal ventral spine of tibia of arm of adult
small, more or less conical, not decumbent
(much as in *P. ceylonicus*, pl. xxxi, fig. 14) ... *P. granulatus*, p. 454.
Terminal ventral spine of tibia of arm of adult
long, parallel-sided, decumbent (pl. xxxi, fig. 13) *P. phipsoni*, p. 454.

Phrynichus reniformis (Linnaeus).¹

The identity of this species can only be settled by a further examination of the type which is preserved in the Zoological Museum at Upsala (see above, p. 447).

Phrynichus lunatus (Pallas).²

Also an indeterminable species (see above, p. 447).

Phrynichus ceylonicus (Koch).³

(Plate xxxi, fig. 14.)

Three varieties of this species may be recognized as follows:—

- A. ♂ & ♀; width of carapace of adult 15-18 mm.;

$$\frac{\text{length of femur of arm}}{\text{width of carpace}} = 2.22 \quad \textit{ceylonicus} \text{ (Koch), } s. \textit{ str.}$$
- B. ♀; width of carapace of adult 13-14.5 mm.;

$$\frac{\text{length of femur of arm}}{\text{width of carapace}} = 1.5-1.8$$
- C. ♂; width of carapace of adult 10.5-13 mm.;

$$\frac{\text{length of femur of arm}}{\text{width of carapace}} = 1.8-2.3$$
- D. ♂ & ♀; width of carapace of adult 8-10.5 mm.;

$$\frac{\text{length of femur of arm}}{\text{width of carapace}} = 1.1-1.5 \quad \textit{var. pusillus, Pocock.}^5$$
- } *var. gracilibrachiatus,*
Gravely.⁴

I. *PHRYNICHUS CEYLONICUS* (Koch), *s. str.*

This form is remarkable for its ability to live in comparatively dry surroundings; it seems to live mainly in jungles where the soil is specially porous or the climate not very moist, and in houses in moister regions. Specimens from the following localities in Ceylon are preserved in collections belonging to the Indian Museum, to the Colombo Museum, or to Mr. E. E. Green:—

North East Province: Horowapotama, *ca.* 200 ft.; Moha-Illupalama, *ca.* 300 ft.

Western Province: Wennappuwa, 10 mls. from Negumbo.

Central Province: Nalanda, *ca.* 900-1000 ft.; Galagedara, *ca.* 800-2000 ft.; Haragama, *ca.* 1200 ft.; Kandy, *ca.* 1500-2000 ft.; Peradeniya, *ca.* 1500 ft.

Southern Province: Ambalangoda, 0-100 ft.; Kottowa, 0-100 ft.

¹ *Systema Naturae*, 10th ed., p. 619.

² *Spicilegia Zoologica*, fasc. IX, pp. 33-37, pl. iii, figs. 5-6.

³ *Die Arachniden*, X, p. 336, fig. 776.

⁴ *Spolia Zeylanica*, VII, p. 140.

⁵ *Ann. Mag. Nat. Hist.* (6), XIV, p. 296.

There must, I think, be some mistake about a specimen in the Indian Museum collection that is supposed to have been collected by Major Beddome in South India.

This is the largest form of *P. ceylonicus* known, and full-grown specimens may easily be distinguished from the varieties *gracilibrachiatus* and *pusillus* by their size. Younger specimens may be distinguished by the loss, at a time when the size of the specimen is greater than that at which these changes take place in the permanently smaller forms, first of the bright and chequered juvenile colouration, and later of the first of the three spines on the upper surface of the distal end of the tibia of the arm. But in the smallest specimens of all there appears to be no certain means of distinguishing the different forms.

The fully grown female of var. *gracilibrachiatus* is the only other form at all likely to be confused with this typical form. It approaches the typical form much more closely in size than do either the male of the same variety or either sex of var. *pusillus*; and, except when their maturity is made evident by the presence of embryos under the abdomen, the identity of these forms is very difficult to establish unless by comparison with a good series of typical specimens in various stages of growth.

The presence of a pair of well-developed semilunar lobes on the posterior margin of the third abdominal sternum of *P. ceylonicus*, s. str., is useful in checking the identity of immature specimens, as in the varietal forms these are always proportionally smaller than is usual in the typical one, and they are often apparently absent altogether. But as, in a long series, every stage can be found from their absence in the varieties to their full development in the typical form, their condition does not in itself fully indicate to which of the three forms a specimen belongs.

The following measurements of the mature or approximately mature specimens in the Indian Museum collection will serve to indicate the proportions borne by the arms to the width of the carapace in adults of this form:—

Sex.	♂	♀ (with embryos).	♀	♂	♂	♂
Width of carapace in mm.	18	17.5	17	16	16	15
Length of femur of arm in mm.	40.5	35.5	34	33	33	31

2. *P. CEYLONICUS* var. *GRACILBRACHIATUS*, Gravely.

The habits of this form resemble, so far as is known, those of the next variety.

The Indian Museum collection contains specimens from the following places in Ceylon:—

Central Province : Nalanda, *ca.* 900-1000 ft. ; Galagedara, *ca.* 800-2000 ft. ; Kandy, *ca.* 1500-2000 ft. ; Peradeniya, *ca.* 1800 ft.

The sexes of this variety differ from one another in a more striking manner than do those either of the typical form or of the other variety of the species, and but for certain indications of an identical geographical distribution for the two and the fact that I have seen no female which superficially resembles the male of this variety, and no male which resembles what I believe to be its female, it would hardly, perhaps, have occurred to me to regard them as a single form. Thus the adult male is small,¹ often closely resembling var. *pusillus* in the size of its body, though always distinguished therefrom by its relatively longer appendages, the arms especially being very noticeably longer and slenderer, bearing about the same proportion to the width of the carapace as they do in adults of *P. ceylonicus*, *s. str.* ; whereas the female is large, being intermediate in size between *P. ceylonicus*, *s. str.* and var. *pusillus*, and has proportionally shorter arms. Specimens in which maturity is not clearly indicated by the presence of embryos under the abdomen may therefore be very easily mistaken for immature specimens of *P. ceylonicus*, *s. str.*, since the proportion borne by the arms to the width of the carapace increases with growth.

So far as I know it is impossible to distinguish immature specimens of either sex of var. *gracilibrachiatus* from those of var. *pusillus* ; and from this it may be concluded that the arms of the male of the former become greatly lengthened at about the time when maturity is reached (as do those of the male of *Charinides bengalensis*) and that previously they are no longer than in the latter variety.

In practice there is never any difficulty in distinguishing the adult male of var. *gracilibrachiatus* from the form most like it—the male of var. *pusillus*. But to distinguish adult females of var. *gracilibrachiatus* from immature females of *P. ceylonicus*, *s. str.*, of the same size is much more difficult except, as has already been pointed out, when the former bear embryos. The chief differences between the two are :—(1) the retention in (? all) specimens of the latter of a distinctly spiniform rudiment of the first of the three dorsal spines at the distal extremity of the tibia of the arm, a spine which has probably already disappeared in all specimens of the former ; and (2) the size of the semilunar lobes on the posterior margin of the third abdominal segment, which are always present

¹ This difference in size and proportions shown by the two sexes is present in var. *pusillus* also, and probably in *ceylonicus*, *s. str.*, as well ; but in these two forms it is less striking, and only apparent in a series of measurements ; whereas in var. *gracilibrachiatus* it is very noticeable at once—more so in fact than the measurements would lead one to suppose. The name *gracilibrachiatus* is an unfortunate one now that *pusillus*, Poc., has to be regarded as a variety and not a species ; for it is from this form only that var. *gracilibrachiatus* is distinguished by the slenderness of its arms, and not from *P. ceylonicus*, *s. str.* It was as a variety of *P. pusillus*, Poc., that *gracilibrachiatus* was originally described.

and usually well developed in *P. ceylonicus*, *s. str.* but are either small or absent in var. *gracilibrachiatus*.

The following measurements (in mm.) were used in calculating the proportions given for this variety in the table on p. 449:—

Sex.	♀ (with em- bryos).	♀	♀ (with em- bryos).	♀	♂ (type)	♂	♂	♂	♂	♂	♂	♂
Width of carapace.	14.5	13	13	13	13	13	12	11.5	11.5	11	10.5	10.5
Length of femur of arm.	25	23	22	20.5	29.5	28.5	25	24	24	22.5	20.5	19

3. *P. CEYLONICUS* var. *PUSILLUS*, Pocock.

This variety is unable to live long in the absence of moisture. It is only known from the Central Province of Ceylon, and was first described from specimens caught at Punduloya by Mr. E. E. Green, who tells me he got them at an altitude of about 4200 ft. above sea level. It is represented in the Indian Museum collection by specimens from Nalanda, *ca.* 900-1000 ft.; Galagedara, *ca.* 800-2000 ft.; Kandy, *ca.* 1500-2000 ft.; Peradeniya, 1600-2200 ft.

The best means of distinguishing this variety from the last and from the young of *P. ceylonicus*, *s. str.*, have already been dealt with (pp. 450-451). One other character remains, however, to be noted here: it is quite common to find the first of the three dorsal spines at the distal end of the tibia of the arm represented in mature specimens of this variety by a distinct spiniform process. The process is, however, always very much smaller than in young specimens of equal size of *P. ceylonicus*, *s. str.* Thus the greatest length for this spine seen in an ovigerous female of var. *pusillus* was about 0.5 mm.; but in a specimen of *P. ceylonicus*, *s. str.*, of approximately the same carapace-width (former 8 mm. the latter 7.5 mm.) this spine is as much as 2 mm. long, and in a somewhat older specimen (carapace-width 9.5 mm.) it is 1.5 mm. long.

The following are measurements (in mm.) taken from the series of this variety in the Indian Museum collection:—

Sex.	♂ (with embryos).	♀	♀	♀	♀	♀ (with embryos).	♂ (with embryos).	♂ (with embryos).	♂	♂	♀	♂	♀ (with embryos).	♀ (with embryos).	♂	♂	♀ (with embryos).	♀ (with embryos).	♂	♂	
Width of carapace.	10.5	10	10	10	9.5	9.5	9	9	9	8.5	8.5	8.5	8.5	8.5	8.5	8	8	8	8	8	8
Length of femur of arm.	14.5	13.5	12.5	12	11	10.5	13.5	11.5	10	11.5	11	11	10.5	10	9.5	9	9.5	9	9	9	8.5

***Phrynichus nigrimanus* (Koch).¹**

The Indian and Madras Museums possess between them specimens from all but one² of the following localities, all of them on the eastern side of the Indian Peninsula:—

Orissa : Hills, 0·000 ft., near Barkul, Chilka Lake ; Balugaon
Chilka Lake.

Ganjam : Russelconda.

Vizagapatam District.

Nellore : Rambuga cave, Udyagiri droog.

Karnul : Bairani, Chelama Ry. Station, Nallamalais, *ca.* 2000 ft.

N. Arcot : Vellore.

Chengalpat : Pallavaram, 12 miles from Madras.

Salem : Shevaroy Hills.

Barkul is the only place where I have myself collected specimens of this species. They are quite common in the hills and in the jungle at the foot of them, but I failed to get any very large specimens or ovigerous females—though I went for this purpose in the rains, when *P. ceylonicus* breeds. None of the specimens found had lost the third spine on the dorsal surface of the distal end of the tibia of the arm ; but one of the largest of them, in which it was quite small (about 0·5 mm. long), did so on casting its skin after a few weeks' captivity, when the spine was reduced to a tubercle. The width of the carapace of the cast skin of this specimen is 12·0 mm., that of the specimen itself being 14·0. Probably mature specimens are at least 14 mm. across the carapace and live, as is more or less the case with other species, in the securest retreats.

In the hills further south the species attains a much greater size than at Barkul. This does not, however, appear to be the case near the coast since the width of the carapace of the Pallavaram specimen, in which the third spine on the dorsal surface of the distal end of the tibia of the arm is absent, is barely 13 mm. The third spine on the dorsal surface of the distal end of the tibia of the arm is over 2 mm long in the specimen from Rambuga cave, the width of whose carapace is 11 mm.; and it is nearly 2½ mm. long in two specimens from the Shevaroy's whose carapaces are nearly 11 and a little over 12 mms. broad respectively. The largest specimen I have seen is that from Bairani, whose carapace is 20 mm. broad. It appears to be a mature female. The length of the femur of the arm is 38·5 mm., and the third dorsal spine at the distal end of the tibia of the same appendage is tuberculiform. This specimen belongs to the Madras Museum. It is possible that this form and the one common at Barkul may ultimately have to be recognized as distinct varieties or subspecies.

¹ *Die Arachniden*, XV, p. 69, fig. 1464.

² The only specimen I have seen from Vellore belongs to Rev. J. E. Tracey, to whom my thanks are due for sending it. It is doubtless identical with the form described by Hansen (*Ent. Med.* IV, 1894) as common at Vellore.

Phrynichus granulatus, n. sp.

This species is represented in the collections of the Indian, Madras and Trivandrum Museums by specimens from the following localities:—

Cochin: State Forest Tramway 10th-14th mls., 0-300 ft.;
Kavalai, 1300-3000 ft.

Travancore: Ponmudi, 2000-3000 ft.

The specimen which Pocock records in the "Fauna" from Trivandrum under the name *P. phipsoni* doubtless also belongs in reality to the present species.

This species, whose distinctive characters are given above (pp. 448-449), is intermediate in character between *P. nigrimanus* and *P. phipsoni*, resembling the former and *P. ceylonicus* in the shape of the terminal ventral spine of the tibia of the arm, and the latter in the other spines of both arm and hand. The integuments are more coarsely granular than in any other species with which I am acquainted. In this character the species presumably resembles *P. scaber* (Gervais) from the Seychelles. The male type—the largest specimen known to me—has a carapace 18 mm. broad, the femur of the arm being 31 mm. long. The female type has a carapace 15.5 mm. broad, the femur of the arm being 24.5 mm. long. Both these specimens are from jungle near the rubber estate between the 10th and 14th miles of the Cochin State Forest Tramway.

Phrynichus phipsoni, Pocock.¹

(Plate xxxi, fig. 13.)

This species has been recorded by Pocock from Bombay and Trivandrum, and from various other localities by subsequent authors, who have apparently confused with it the earlier stages of other species, *i.e.* the stages which retain the third dorsal spine of the distal end of the tibia of the arm. I have little doubt that the Trivandrum specimen referred to by Pocock belongs in reality to the preceding species, and that *P. phipsoni* is confined to the more northerly parts of the Western Ghats.

Phrynichus scaber (Gervais).²

Gervais records this species from the Seychelles, and the same or an allied form from Mauritius. Its distinctive characters have yet to be described.

Phrynichus scullyi, Purcell.³

This species is recorded only from Cape Colony (Pakhuisberg in Clanwilliam Division, and Namaqualand). The specimens from which it was described were probably young, judging from their size and colour.

¹ *Ann. Mag. Nat. Hist.* (6), XIV, 1894, p. 295, pl. viii, fig. 4.

² *Histoire Naturelle des Insectes, Apteres*, III, p. 3.

³ *Ann. S. Afr. Mus.*, II, 1902, p. 206.

Phrynichus bacillifer (Gerstaecker).¹

This species, according to Kraepelin, occurs from Madagascar and Zanzibar to Mozambique, Tanganyika and Lake Rudolph.

Phrynichus deflersi (Simon).²

Described from a single specimen from Obock in French Somaliland.

Phrynichus jayakeri, Pocock.³

Described from two specimens from Muscat in Arabia.

Phrynichus spp.

The above record of the distribution of various species of *Phrynichus* by no means exhausts the localities given by previous authors. Most of the additional localities refer to the composite "species" to which Kraepelin applied the name *P. reniformis*; others refer to species which have clearly been wrongly named. These localities, and those of certain immature specimens in the Indian Museum collection, show the distribution of the genus to be wider than appears above, and may therefore be recorded here:—

Africa: Natal; Mozambique; Kondoa (? French Congo); Massaua (Somaliland); several localities in Central Africa (Albert Lake, Kossenje; Kirk Falls south-west from Albert Lake; plains below Semliki; Awakubi).

Madagascar (east coast).

Asia: Arabia—Aden.

Assam—Sibsagar.

Siam—Chantaboon.

Cochin China—Saigon.

Malay Peninsula—Penang.

Genus **DAMON**, Koch.⁴

Type *D. variegatus* (Perty).

I have nothing to add to Kraepelin's account of this genus. It is mainly African, but Kraepelin records *D. variegatus* from Arabia as well.

¹ *C. v. d. Decken's Reisen in Ostafrika*, III (2), p. 472.

² *Bull. Soc. Zool. France*, XII, 1887, p. 454.

³ *Ann. Mag. Nat. Hist.* (6), XIV, p. 294.

⁴ *Ubersicht des Arachnidensystems*, V, p. 81.

EXPLANATION OF PLATE XXXI.

- FIG. 1. Four distal joints of arm of *Catageus pusillus* from above (diagrammatic, showing armature of dorsal margin).
- „ 2. Basal joint of finger of *Phrynichosarax cochinensis*.
- „ 3. „ „ „ „ *javensis*.
- „ 4. „ „ „ „ *buxtoni*.
- „ 5. „ „ „ „ *singapurae*.
- „ 6. „ „ „ „ *rimosus*.
- „ 7. Four distal joints of arm of *Sarax willeyi* from above (diagrammatic, showing armature of dorsal margin).
- „ 8. Hand of *Sarax sarawakensis*.
- „ 9. Four distal joints of arm of *Stygophrynus moultoni* from above (diagrammatic, showing armature of dorsal margin).
- „ 10. Back of hand of *Stygophrynus longispina*.
- „ 11. „ „ „ „ *berkeleyi*.
- „ 12. „ „ „ „ *cerberus*.
- „ 13. Hand and distal part of tibia of arm of *Phrynichus phipsoni* from below.
- „ 14. Hand and distal part of tibia of arm of *Phrynichus ceylonicus*, s. str., from below.

